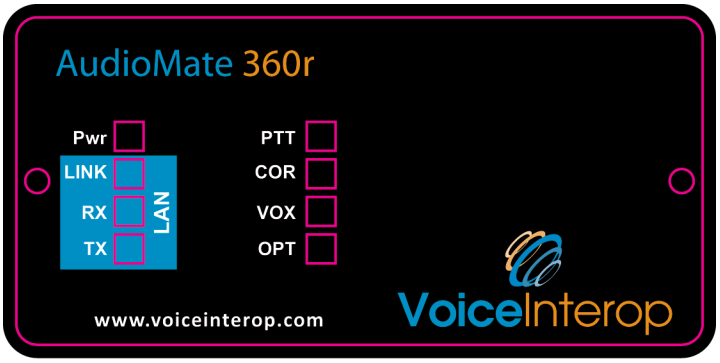
AM360r

AudioMate 360r User Guide

IP Voice Gateway for Land Mobile Radio



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QUICK START

Quick Start Guide

Gather Your Tools

Web browser — Mozilla Firefox, Opera, Chrome, or Internet Explorer.

AM360 Configuration Utility

www.voiceinterop.com

Register as a customer

Choose the Support tab.

Download AudioMate 360 IP Address Assignment utility

AM360 Configuration Utility — To find the address of each AM360 gateway, download the AudioMate 360 IP Address Assignment utility from our web site, www.voiceinterop.com under the Support tab. You must first register as an owner of an AudioMate 360 gateway to be granted access.

NO soldering iron nor screwdriver is needed to set up the gateway, just a web browser and a plan.

Basic Configuration Steps

- Find the IP address
- Log in
- Set the RTP address and ports
- Check for proper control signals and logic levels on the radio interface
- Set audio levels with a partner listening

Find the AudioMate 360 IP Address

Use the AM360 (AudioMate 360) Configuration Utility to find the IP address that was assigned by your DHCP server. Click the **Locate** button and select a unit from the list on the left pane.

Log In to the AudioMate Unit with a Web Browser

Type the IP address of the desired AudioMate into the address bar of your web browser and press Enter. The AM360 will prompt you for the user name and password. The factory values are **`admin`** and **`password`**.

Set the RTP Address and Ports

The default AM360 settings might be all that you need to get going. If necessary, set the Remote RTP Address, RTP Remote Port, and RTP Local Port to communicate with your audio network. Refer to Appendix B for tips on selecting i.p. multicast addresses.

Check Control Signals

Ensure that the proper cable is connected between the AM360r and the radio. Set the COS Polarity and PTT Polarity to match the needs of the radio. Check that the AM360r is able to key the radio transmitter and that the radio is programmed to provide COR/COS/RUS/ Receive Activity indicator on the proper wire. Proper radio programming is critical.

Set Audio Levels With a Partner

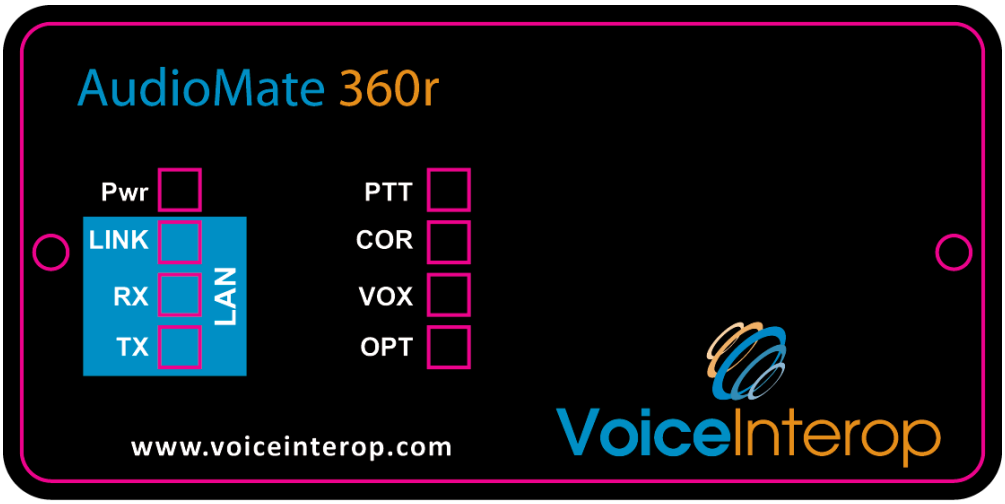
Set the Transmit and Receive Gain to acceptable levels that make the radio transmissions intelligble and pleasant to listen to. This test requires two people: one to talk and another to listen.

See the Configuration section for detailed instructions.

TOUR

AudioMate 360r Product Tour

Front Panel



Front Panel Indicators

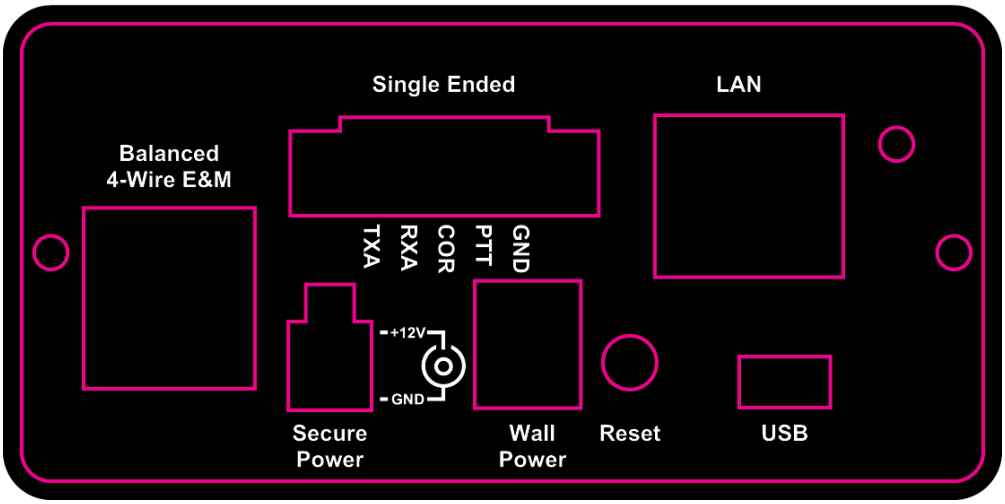
All front panel indicator LEDs can display one of seven color states: OFF, RED, RED FLASHING, GREEN, GREEN FLASHING, AMBER and AMBER FLASHING each of which can be used to indicate a different condition within the AudioMate 360r.

LED	Amber	Amber flashing	Green	Green flashing	Red	Red flashing
Pwr (Power)	Booting, awaiting DHCP address	N/A	Normal operation	N/A	Boot error (view boot via USB serial port)	N/A
Link	N/A	Check LAN cable connection	LAN connection OK	AMCP data traffic rcvd	N/A	N/A
Rx	Buffering audio from IP network	N/A	Playing rcvd RTP stream out radio port	N/A	N/A	N/A
Tx	N/A	N/A	N/A	N/A	Sending RTP stream to IP network	N/A
PTT	N/A	N/A	N/A	N/A	M-lead asserted	N/A
COR	COR/COS inhibited	N/A	COR input is active	N/A	N/A	N/A
VOX	Enabled	N/A	Active	N/A	N/A	N/A
Opt (Option)	N/A	N/A	Anti-chirp is active	N/A	N/A	N/A

Front Panel Connections
There are no connections to the front panel of the AudioMate 360r.

Front Panel Controls
There are no input controls on the front panel of the AudioMate 360r.

Rear Panel



Rear Panel Indicators
LAN Port — The LAN jack has two built-in lamps: a solid green one indicating that an electrical link has been established, the other flashing green indicating packet activity.

Rear Panel Connections
4-Wire Balanced — This RJ-45 port provides a balanced 600 ohm transformer-coupled audio connection to 2-way radios and telephone lines. There are multiple standards for connections to a radio using the RJ-45. The electrical specifications and pin assignments for the AudioMate 360r balanced audio connector are given in Appendix A, along with interface examples. Be careful not to connect an Ethernet cable to the balanced audio port, as they both employ RJ-45 jacks.

Single Ended — Allows connection of single-ended audio and control signals from popular 2-way radios via a secured 5-pin plug. This plug accepts stranded or solid wire. All signaling is single ended, referenced to ground. The pin assignments and electrical specifications for the AudioMate 360r Analog connector are given in Appendix A, along with interface examples.

Single-Ended Connector
The green 5-pin Single-Ended connector on the rear of the AM360r mates with Dinkle part #EC350VM-05P for the secured screw type part #EC350V-05P for the plain type.

LAN — Standard 10/100BaseT Ethernet port with pin-outs following the AT&T T568B specification. A standard Category 5 LAN cable connects it to an Ethernet switch. Be careful not to connect the balanced audio cable to the LAN port, as they both employ RJ-45 jacks.

USB — (Factory use only)

12 V — 12 Volt d.c. input, tip is positive, ring is negative. The supplied power adapter converts 120 Volt a.c. main power to 12 Volts d.c. at 500 mAmps maximum, suitable for one gateway. The power plug is a commonly available 2.1mm inner diameter and 5.5mm outer diameter.

The Mate-N-Lok jack is connected in parallel to daisy chain other AM360 gateways from a **larger** power supply. The top 2 pins are +12 Volts, the bottom two are Ground.

Rear Panel Controls

Reset — This recessed push button reboots the processor in the AudioMate 360. Depress using a pen or any object with a small tip. The length of time that it is held depressed determines the type of reset:

Quick Reset – A momentary press performs a simple reboot.

Factory Reset – To reset the unit to its factory-default configuration press and hold the Reset pushbutton until the OK light goes from AMBER to GREEN. While the AudioMate 360 is awaiting an address from a DHCP server this could take as much as 60 seconds. In order to ensure that the device loads factory default settings the Reset button must be held this entire time, until the OK light changes from AMBER.

INSTALLATION

Installation

Network Considerations

In the typical AudioMate installation all endpoints are contained entirely within a corporate LAN, or participate via a WAN link, either unicast through a VPN or an engineered MPLS network, for example.

Bandwidth Consumption and CoDecs

The G.711 codec (encoder/decoder algorithm) consumes approximately 84kilobits/second each direction per stream. The GSM Full Rate codec consumes less bandwidth, but produces lower quality audio and is not suitable for tone remote applications. In modern networks we recommend using the G.711µ Law for almost all applications.

Electrical Considerations

The AudioMate 360 gateways are powered by 12 Volts d.c. from the provided plug-in power supply or by a 12 Volt battery with float charging system. In either case, the power must be clean and free of a.c. noise components and interruptions. The supplied power module should be plugged into an uninterruptible power supply (UPS) for trouble-free service. If a 12 Volt battery/charger system is used, the charger must keep noise to less than 12mVp-p.

If multiple AM360 gateways are powered by a single supply, it must provide sufficient current. A maximum of 8 AM360 gateways may be connected in daisy chain fashion using the Mate-N-Lok connectors.

CONFIG

Configuration

Each unit requires two groups of configuration data: one group that is common across the AudioMate 360 family and a second group that is specific to the application of the unit.

Network Address

The units are shipped with DHCP enabled and will accept whatever address is assigned by your DHCP server. On startup the AM360 will wait up to 60 seconds for a DHCP server to assign its IP address. On timeout the AM360 will assign itself a default IP address of **`192.168.0.254`** and a netmask of 255.255.255.0.

AM360 Config Utility

The Address Finder utility is available to registered users by logging in to our web site:

www.voiceinterop.com

Click the Support tab.

Locating the AM360 Address

Use the AudioMate 360 Configuration utility to locate the addresses of your units in preparation for configuration. Individual AudioMate 360 units are configured via web browser pointed to the management IP address of the unit. The Address Finder utility is available by logging in to our web site

`www.voiceinterop.com`

Click the Support tab to find the link to download the AM360 Configuration Utility.

Open the AM360 Configuration Utility and click the **Locate** button and select a unit from the list on the left pane. The IP address of each unit is to the right of each minus sign.

Configuring by Web Browser

Type the address of the desired AM360 unit into the address bar of your web browser. (At the time of this writing the freely available Mozilla Firefox web browser provides smoother operation for these purposes.)

AudioMate 360 Login

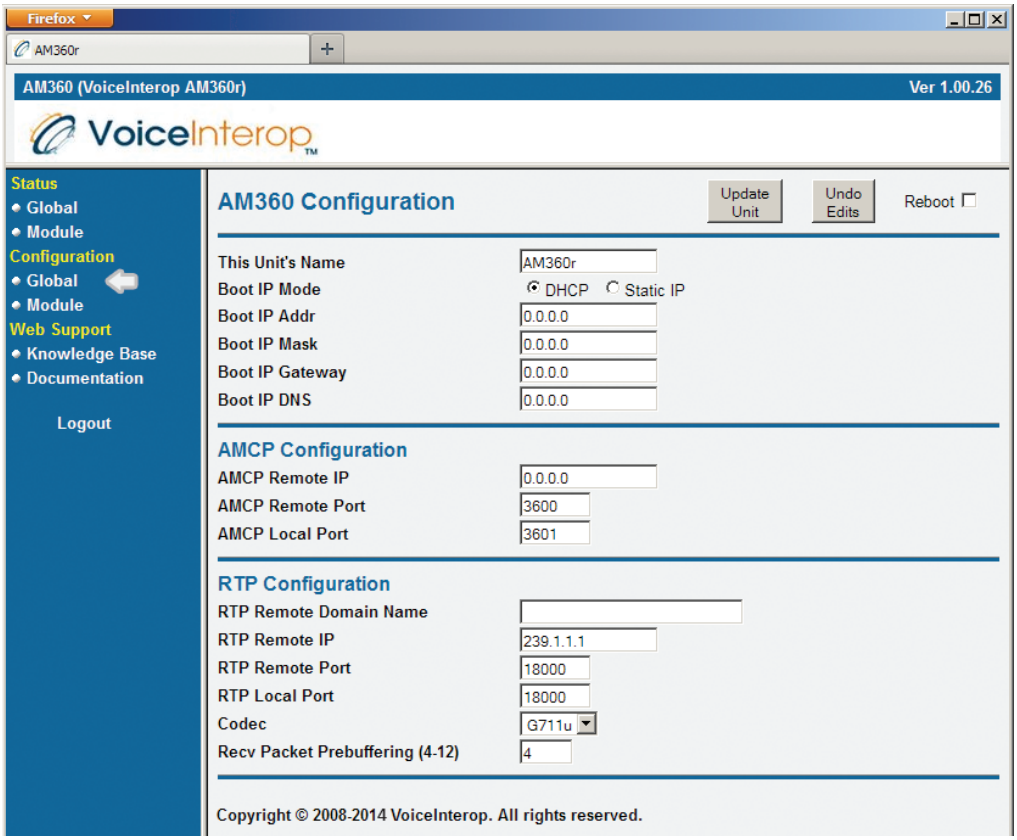
username = admin

password = password

Logging In

Like most network devices, the AM360 is protected by a password. The factory default for user name is **`admin`** and the factory default password is **`password`**.

When prompted by the web interface enter the appropriate user name and password. If they were accepted you will see a two part screen with a menu panel on the left pane and a page labeled **AM360 Status** on the right pane.



Global Configuration

In the menu pane on the left, locate the **Configuration** heading and click the link **Global** under it. The screen labeled **AM360 Configuration** should appear in the right pane.

You may safely ignore the **AMCP** settings.

This Unit's Name allows you to set a memorable name to identify this unit among the others on your network. This field accepts standard alphanumeric characters.

Boot IP Mode selects between automatic IP address assignment by your DHCP server or static IP address assignment specified in the fields that follow. If you select Static IP and then click the **Update Unit** button, the **IP Boot** fields will be filled with current values. If you select DHCP and click the **Update Unit** button the fields will be returned to 0.0.0.0 which indicates DHCP. Note that editing and saving the Boot IP fields has no effect on communications until you reboot the unit.

Boot IP Addr
After changing the IP address of the AM360r you must reboot the unit to make the new IP address effective.
Also remember to change the address in your browser!

Boot IP Addr sets the static unicast management IP address used to configure this unit. Default is 0.0.0.0 for DHCP. Once you change this address, set the mask, update and reboot the unit, remember to point your web browser to the newly assigned address.

Boot IP Mask sets the netmask or network portion of the IP address. In a typical Class C network this will be 255.255.255.0 while the default value is 0.0.0.0 for DHCP use. If you set a static IP address you must also set this field to represent the size of your network.

Boot IP Gateway sets the next-hop gateway router that will carry the AM360r packets to other networks. If you set a static IP address you must also set the gateway to the gateway router on your network. The default value is 0.0.0.0 for DHCP use.

Boot IP DNS sets the IP address of your DNS server, if needed. Typically this address will be the same as your default gateway in small networks. Default is 0.0.0.0 for DHCP use.

AMCP Configuration

You may safely ignore the AMCP settings.

Multicast Addressing
Appendix B has more detail on selecting multicast addresses with pointers to reference sources.

RTP Configuration

RTP Remote IP is the address to which audio packets will be sent. In multicast networks type the multicast group which will share audio with other units on the same multicast group. The Class D multicast range lies between `225.0.0.0` and `239.255.255.255` with numerous restrictions and considerations. Consult Appendix B for more information on multicast address assignment. For point-to-point unicast links type the unicast address (Boot IP Address) of the **other** end of the link, not this unit. Default is 239.1.1.1 multicast group.

RTP Remote IP
is the address of other unit if using unicast, not the one that you are configuring.

RTP Remote Port is the IP port number assigned to this channel on the **other** end of the link. This should be an even number between `16384` and `65534`. Default is 18000.

RTP Local Port is the IP port number on which this AM360 will listen and is typically identical to the **RTP Remote Port** number. Default is 18000.

Codec should be set to **G711u** for most applications. Other choices are **G711a** for G.711 A-law, and **GSM** for GSM 6.1 full rate. The G.711 codecs use about 84 kbits/second each way while the GSM codec uses about 13 kbs/sec. Default is G.711 μ-law codec.

Save Your Changes

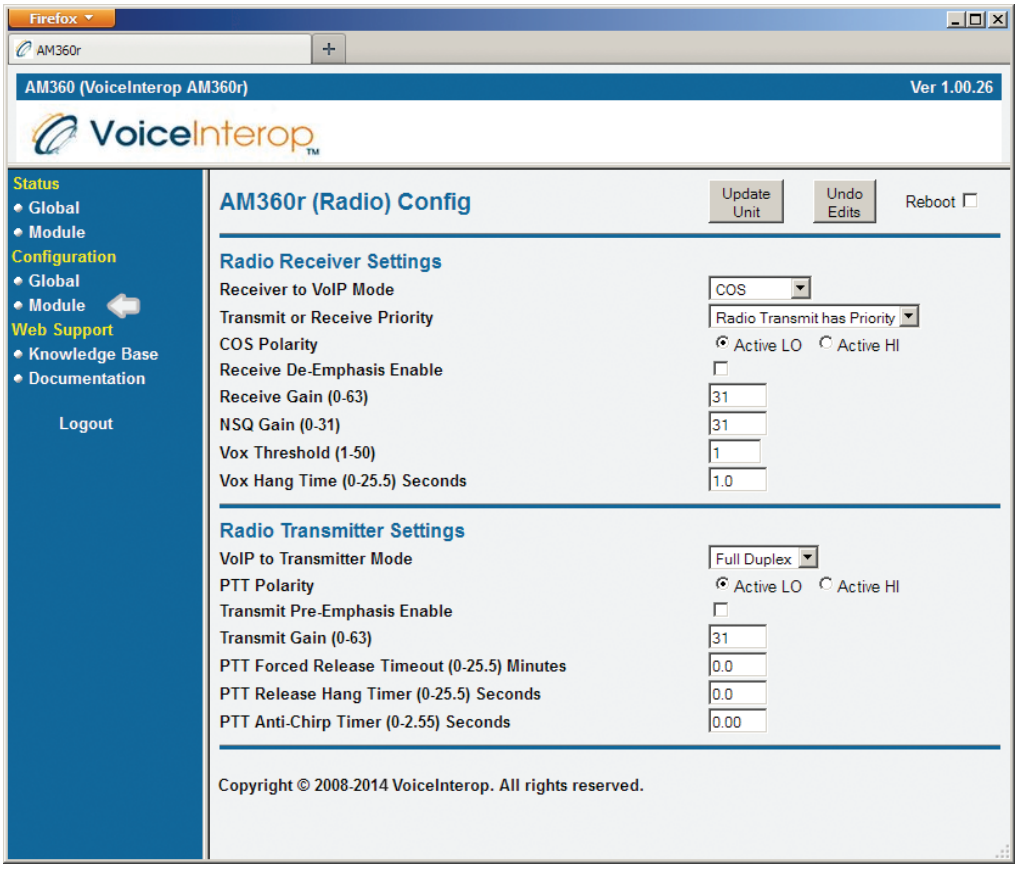
Update Unit button — When you are satisfied with all the settings that appear on the **Global Configuration** page, be sure to click on the button labeled **Update Unit** at the top of the page. Your new settings take effect immediately, except for the fields labeled IP Boot. The IP Boot fields only take effect after a reboot.

Undo Edits button — To revert back to the previously saved values while editing click the button labeled **Undo Edits** at the top of the page.

Reboot checkbox — To reboot, check the **Reboot** box and click the **Update Unit** button. Any changes are saved before the reboot is executed.

Module Configuration

In the menu pane on the left, locate the **Configuration** heading and click the link **Module** under it. The screen labeled **AM360r (Radio) Config** should appear in the right pane.

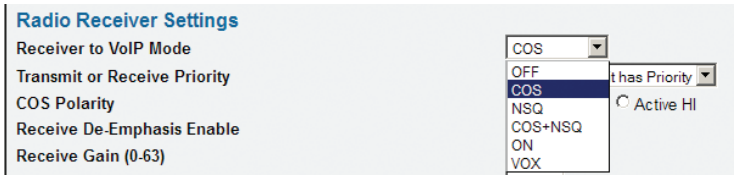


Radio Receiver Settings

Receiver to VoIP Mode drop-down listbox determines the triggering mechanism that will begin the stream from the radio receiver to the IP network.

OFF prevents any radio receive audio from being streamed to the IP network.

COS (Carrier-Operated Switch) will stream audio to the IP network when the COS digital input is asserted, either on the Single-Ended COS logic line or the E-lead of the balanced audio interface.



Tone Remote Control

Set Receiver to VoIP Mode to ON to send RTP audio packets full time to the radio end of the link.

NSQ (Noise Squelch) [deprecated] is only useful when the receive audio input of the AudioMate 360r is connected to the radio receiver's unsquelched discriminator source in an analog FM radio. The AudioMate 360r will determine the presence of received signal based on the reduction in white noise from the radio. If this setting is selected, then the NSQ Gain setting must also be configured for proper operation.

COS+NSQ (AND Squelch) [deprecated] computes the Boolean logic value of the COS AND NSQ. That is, if the COS digital input is asserted and the NSQ detector is also active, then the AudioMate 360r will stream receive audio to the IP network. The most common application for this setting would be to use the noise squelch detector to ascertain that an intelligible signal is present at the radio receiver while the COS input is connected to a coded squelch detector (PL or DPL) to block out all but the desired users on the channel. This is commonly referred to as "AND Squelch".

ON activates the receive audio stream at all times, even when there is no receive audio to send. Note that this setting can interfere with proper operation of console channel patches. Use this to establish an audio trunk for tone remote control.

About VOX

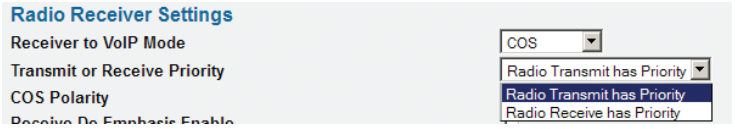
VOX should be used with caution. VOX can cause operational problems if not configured carefully.

The VOX detector listens for audio above the configured threshold. ANY sound will trigger the streaming of packets.

It is always preferable to use the hardware COS signal if the radio provides it.

VOX enables voice activation of packet streaming for radios that do not provide the far superior hardware COS logic output to indicate that a signal is being received. When VOX is selected set the **Vox Threshold** and **Vox Hang Time** fields to non-zero values.

Transmit/Receive Priority should be set at default of **Radio Transmit has Priority** unless you have a special radio network. Normally, incoming RTP packets will key the radio transmitter regardless of whether the radio receiver is active. The only use case for **Radio Receive has Priority** is a simplex multinode radio network where the AudioMates connect all radios via IP multicast; giving radio receive the priority prevents receivers within range of the transmitting node from locking up the system in a feedback loop.



COS Polarity sets the AudioMate 360r unit to begin streaming audio to the IP network when the COS hardware logic input is held either low (approximately 0 Volts) or high (3-12 Volts). Consult your radio documentation to determine the proper setting.

Receive De-Emphasis Enable (default cleared) Checking this box will apply a 6dB per octave roll-off of high frequencies; this is effectively a low-pass filter using an industry standard curve in cases where the audio input to the AudioMate 360r is connected to the discriminator output of an analog FM radio. Clear the check box to allow the receive audio to pass through the AudioMate 360 with no equalization (flat audio).

Receive Gain accepts a number from 0 to 63 representing 64 steps of gain or attenuation in the audio line from the attached radio receiver. Level 0 represents the lowest audio level while 63 represents the highest audio level. Every installation is unique, adjust for your installation for proper operation. Default is 31.

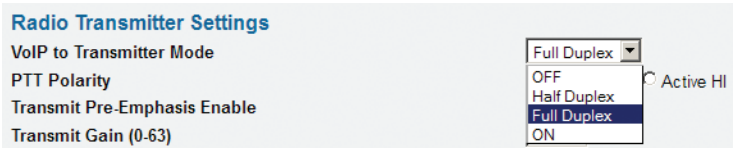
NSQ Gain [deprecated] sets the squelch level provided by the AudioMate 360r when the receive audio input is connected to the discriminator output of an analog FM radio. This setting is only useful when **NSQ** or **COS+NSQ** is selected in **Analog Receiver to VoIP Mode** above. It is also likely that you will want to check the box for **Receive De-Emphasis Enable** as well. Default is 31.

VOX Threshold sets the relative audio level that will trigger the transmission of packets to the IP network. Note that this setting interacts with the **Receive Gain** setting. The best practice is to set the **Receive Gain** properly, then adjust this **VOX Threshold** for best performance. Default value is 1. To enable VOX, set **Receiver to VoIP Mode** to **VOX**.

VOX Hang Time sets the period during which audio packets will be streamed to the IP network after the input audio falls below the **VOX Threshold** level. Setting this value between 1 to 2 seconds provides for smoothest operation. Default value is 1.0 seconds. To enable VOX, set **Receiver to VoIP Mode** to **VOX**.

Radio Transmitter Settings

VoIP to Transmitter Mode determines whether the AudioMate 360r will allow two-way audio flow or prohibit transmission entirely.



OFF disables the AudioMate 360r from keying the attached radio transmitter. Use to prohibit transmission entirely in listen-only applications where the radio should never be keyed under any circumstances.

Half Duplex will allow the attached radio to transmit on reception of audio packets from the IP network while simultaneously blocking receive audio from the radio. Select this when attached to a conventional radio.

Full Duplex will allow the attached radio to transmit on reception of audio packets from the IP network without blocking audio from the radio. Select this when attached to a full-duplex repeater station or trunked control station to send the talk permit beeps to the remote end. This mode will double bandwidth consumption during times when the unit is simultaneously sending and receiving packets.

ON will force the attached radio to transmit full-time without blocking audio from the radio. Any received audio packets will be sent to the radio transmitter.

PTT Polarity sets the logic level required to key the attached radio. For radios requiring an active low or ground signal on their PTT lines, select **Active LO**. For other types of keying circuits select **Active HI**. Consult your radio technical manual to determine the proper setting.

Transmit Pre-Emphasis Enable (default cleared) will apply a 6 dB per octave high pass filter to the transmit audio stream from the IP network to the transmitter audio of the attached radio. Check the box to apply this filter or clear the check box to allow the transmitted audio to pass unprocessed (flat audio). In general, if the transmit audio line of the AudioMate 360r is connected to the microphone input of the attached radio, then leave this check box cleared. If the audio is fed directly to the FM modulator of the radio, this check box should be checked to enable pre-emphasis.

Transmit Gain accepts a number from 0 to 63 representing 64 steps of attenuation or gain in the audio path from the IP network to the attached radio transmitter. Level 0 represents the lowest audio level while 63 represents the highest audio level. Follow the procedure specified in your radio's technical manual to set this to an acceptable level. The default value is 31.

PTT Forced Release Timeout prevents the attached radio from tying up the channel, such as a stuck footswitch on a console on the IP network. The timer starts when the radio PTT is asserted. If the timer expires during a transmission, the transmitter will be released. Acceptable values for **PTT Forced Release Timeout** range from 0 to 25.5 minutes. Typically this value is set between 1 and 3 minutes for practical LMR applications. Default is 0 which disables this timer.

PTT Release Hang Timer sets the time period between the end of the inbound IP network stream and the release of the PTT signal by the AudioMate 360r. This can be useful if the radio unkeys before all the audio has finished playing out of the buffer. Acceptable values for **PTT Release Hang Timer** range from 0 to 25.5 seconds in increments of 0.1 seconds. Default is 0 which disables this timer.

Anti-Chirp Timer

Use the Anti-Chirp Timer with a point-to-point VOX link to prevent "ping pong" back and forth between radios.

PTT Anti-Chirp Timer mutes the radio receive line for the specified time beginning immediately after PTT is released. Because some inferior radios generate a burst of noise immediately after unkeying, this "chirp" can cause a ping-pong effect when two similar radios are used on both ends of a VOX link. Setting this timer between 0.5 and 1.0 seconds can suppress this problem in an AudioMate point-to-point bridge when both ends use VOX mode. Default is 0 which disables this timer.

Save Your Changes

Update Unit button — When you are satisfied with all the settings that appear on the **Global Configuration** page, be sure to click on the button labeled **Update Unit** at the top of the page. Your new settings take effect immediately.

Undo Edits button — To revert back to the previously saved values while editing click the button labeled **Undo Edits** at the top of the page.

Reboot checkbox — To reboot, check the **Reboot** box and click the **Update Unit** button. Any changes are saved before the reboot is executed.

STATUS

Status

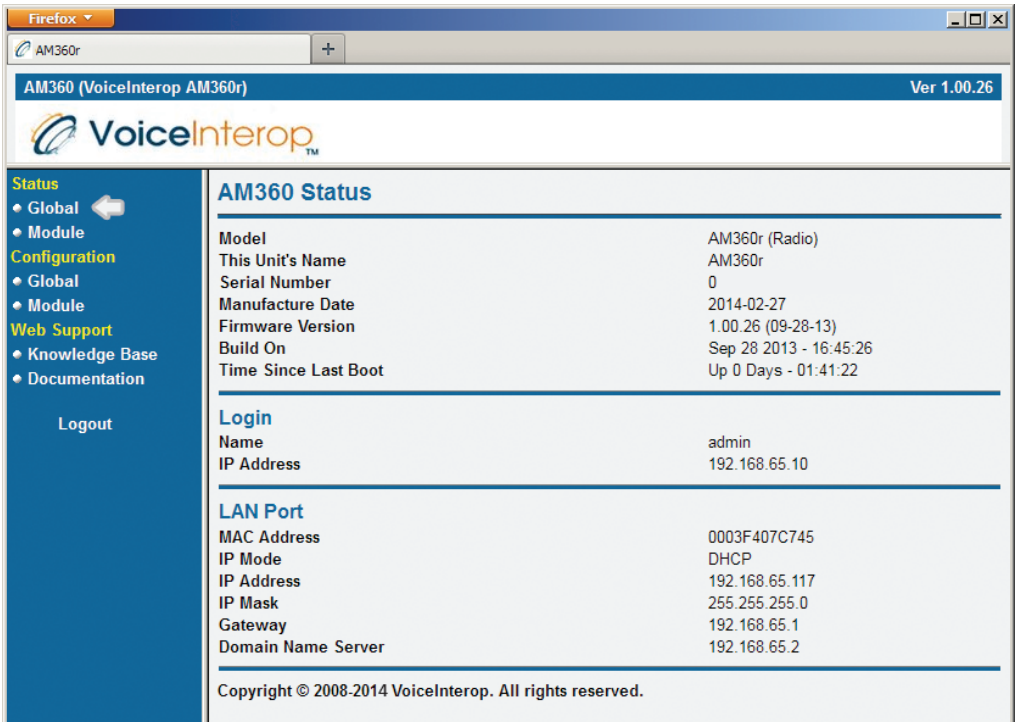
The AudioMate 360 family of IP gateways provide status pages to make adjustments and diagnostics easier.

The AudioMate 360r provides the means to view the status of the digital input and output signals as well as to view the configured transmit and receive audio levels.

Global Status

The Global Status page displays various parameters of the common interface board.

In the menu pane on the left, locate the **Status** heading and click the link **Global** under it. The screen labeled **AM360 Status** should appear in the right pane.



Some noteworthy fields:

Model shows the particular type of AudioMate 360 unit that you are managing.

This Unit's Name displays text that was stored to identify this unit.

Serial Number uniquely identifies this unit.

Login

IP Address shows the address of YOUR computer from which you are managing this unit.

LAN Port

MAC Address shows the Ethernet address of the unit's LAN interface. This uniquely identifies the unit on your network and can be useful in differentiating among several AudioMate 360 units on the same network.

IP Mode shows whether the unit received its address from a DHCP server or is configured with a static IP address.

IP Address shows the currently assigned IP address regardless of how it was obtained.

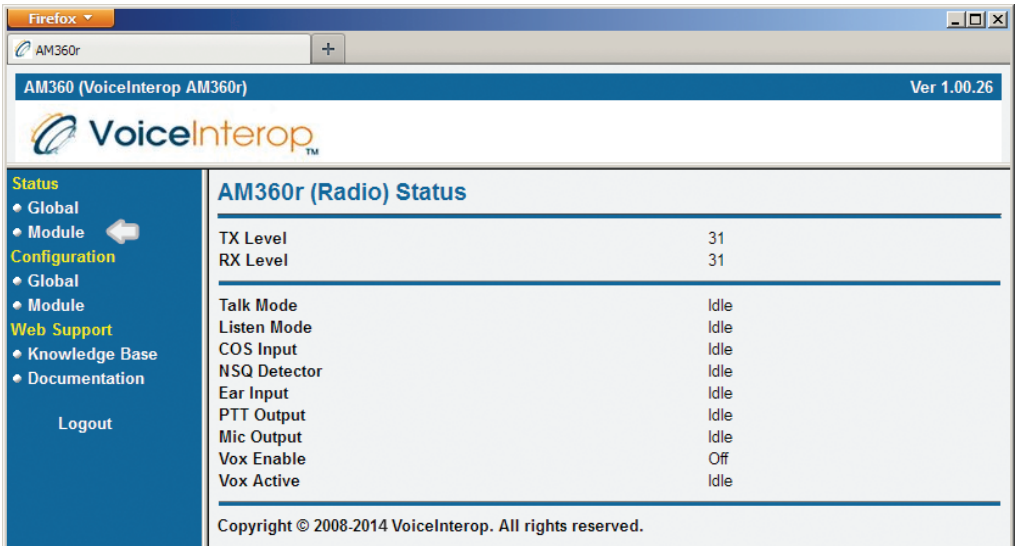
Module Status

Troubleshooting

If you have trouble interfacing the AM360r with your radio, the Module Status screen and front panel LED indicator lamps can quickly tell you what is and isn't working as expected.

The Module Status page displays the configured audio gain settings and the states of the various digital inputs and outputs. Click the Status->Module link to refresh the page. This page should be your first stop when troubleshooting.

In the menu pane on the left, locate the **Status** heading and click the link **Module** under it. The screen labeled **AM360r (Radio) Status** should appear in the right pane.



TX Level and **RX Level** indicate the currently configured transmit and receive audio levels. These can be changed in the **Module Configuration** screen.

Talk Mode when **Active** indicates that voice packets are being sent out the LAN port. This can be triggered by the COS hardware input, VOX voice activation, or by setting **Receiver to VoIP Mode** to **ON** to force full-time streaming. The LAN TX lamp on the front panel will illuminate when this shows **Active**.

Listen Mode when **Active** indicates that the LAN port is receiving voice packets addressed to this unit. The LAN RX lamp on the front panel will illuminate when this shows **Active**.

COS Input indicates that the state of this digital input line is currently at the **Active** level, whether defined to be high or low. In a properly configured system this would go active when the attached radio's receiver is receiving a signal.

NSQ Detector [deprecated] indicates whether the unit's built-in noise squelch detector is receiving enough discriminator noise to turn off the path from the receive audio input to the LAN port. Less noise means more signal which in turn means that this indicator will show Active. In most configurations this will always indicate **Active** since there is no high frequency noise for the detector to decode.

Ear Input follows the state of the E-lead on the balanced audio port.

PTT Output indicates whether this digital output line is asserted, shown as **Key**, or whether it is idle. If troubleshooting and this indicates **Key** yet the attached radio does not transmit, check the wiring of the interface cable and whether the radio requires an active low or active high signal to key the transmitter.

Mic Output indicates the state of the M-lead on the balanced audio port. It shows **Key** when active and **Idle** when inactive. Also known as Mouth lead.

VOX Enable shows the configured state of the voice detector, either **On** or **Off**. The VOX lamp on the front panel will also illuminate when **On**.

VOX Active shows voice detector activity, either **Active** while radio receive audio is being detected or **Idle** when the receive audio falls below the configured VOX threshold.

SPECS

AudioMate 360r Specifications

Physical	
Form factor	Stand-alone unit
Dimensions	1.75 in. (4.5 cm) H x 3.6 in. (9.2 cm) W x 5.2 in. (13.2 cm) D
Weight	0.8 pounds (0.4 kg)
Electrical	
Input Voltage	12 Volts d.c. nominal, 10 Volts d.c. min., 16 Volts d.c. max.
Input current	350 mAmps nominal
Connectors	Coaxial jack, 2.1mm i.d., 5.5mm o.d.; Mate-N-Lok for daisy chain of up to 8 gateways, 5 Amps maximum current draw
Audio Interface	
Line in, balanced	0 dBm nominal, +10 dBm max. @ 600 Ohms; balanced RJ-45 port
Line in, single-ended	2.2 Volts P-P nominal, 5 V P-P max. @ 10K Ohms; on 5-pin inline
Line out, balanced	0 dBm nominal, +10 dBm max. @ 600 Ohms; balanced RJ-45 port
Line out, single-ended	2.2 Volts P-P nominal, 5 V P-P max. @ 100 Ohms; on 5-pin inline
Digital I/O	
Outputs	PTT, 12 Volts @ 500 mAmp MAX., open drain; user-selectable active hi or low; on 5-pin inline SecureScrew Dinkle jack
Inputs	COS, high > 2.5 Volts (18 Volts MAX.); user-selectable active high or low; on 5-pin inline SecureScrew Dinkle jack
L.A.N.	10/100-BaseT Ethernet RJ-45 jack
Serial	USB-mini B diagnostic port (factory use only)
Digital audio	
CoDecs	G.711 μ-law 64kbps, G.711 A-law 64kbps, GSM 6.10 (13kbps)
Environmental	
Operating temperature	0 to +50 Centigrade
Storage temperature	-20 to +60 Centigrade
Miscellaneous	
Indicators	Activity: Power, Link, Tx, Rx, PTT, COR, Vox, Option
Features	Firmware upgrade over Ethernet; web browser configuration screens (no jumpers)
Certification	FCC Part 15 industrial compliance
Robustness	Designed and tested to withstand lightning, transients, overload, and overvoltage.

Specifications subject to change. Note hardware revision and firmware version of your particular unit when consulting specifications and instructions.

Daisy Chain

To power up to 8 AM360 gateways from a single supply, use Tyco Mate-N-Lok plug shell #794617-4 and pins #1-794610-1 with 20 gauge stranded wire. The current should not exceed 5 Amps. The power supply should be rated for at least 8 Amps.

Inline I/O Connector

Digital input/output and single-ended audio signals appear on a 5-pin inline connector that can be secured in place with screws.

It mates with these Dinkle part numbers:
EC350VM-05P SecureScrews
EC350V-05P plain

A

Appendix A - Interface Examples

Ritron Nexus Radio Base

The Ritron NRB is a small, lightweight radio available in VHF and UHF bands that is well-suited to demonstration use. It interfaces with the AudioMate 360r via a straight–through standard Category 5 LAN cable on the hardrware revision B and later units.

Not Working?

Configure Ritron radio E&M jumpers to positions A, C, E for proper operation.

Ritron Jumper Settings

- Remove the 2 side screws and the 2 smaller bottom screws to remove the base of the Ritron radio.
- Locate the E&M daughter board and move jumpers to positions A, C, and E.
- Re-install the cover and screws.

E&M Cable for use with Ritron demonstrator radio

Pin Assignments

Ritron	AM360r	Wire color	Description
1	1	Orange	-12 Volts (SB)
2	2	Orange/White	COS (M-lead)
3	3	Green	Rx balanced audio in from radio
4	4	Blue/White	Tx balanced audio out to radio
5	5	Blue	Tx balanced audio out to radio
6	6	Green/White	Rx balanced audio in from radio
7	7	Brown/White	PTT to Ritron (E-lead)
8	8	Brown	Ground (SG)

Motorola Waris Series

Most Motorola mobile radios in the Waris series (CM and CDM models) use the same pin-outs for basic interfacing via a 16-pin accessory connector on the rear apron. A number of the accessory pins are programmable in the radio using Motorola's closely guarded CPS programming software.

Not Working?

Proper programming of radio accessory pins is ESSENTIAL to interface with Motorola radios. CHECK ACCESSORY PIN PROGRAMMING FIRST.

Radio Programming Necessary For Use With Gateway

In almost every case where a new installation does not work as expected with a Motorola radio, the culprit is an improperly programmed accessory connector. Motorola CPS provides a number of preset configuration macros that speed this process. Look for a preset labeled "telephone interconnect", "phone patch" or similar wording. This should configure the pins of interest to do the right thing.

Pin 8 on a conventional radio must be programmed for combined PL/DPL AND COR indication; on a trunked radio select Talkgroup Activity.

Pin 11 must be programmed to provide squelched receiver audio with constant level.

Program the radio to use Pin 2 which is a mic level input to the transmitter that will provide limiting with pre-emphasis and use Pin 3 for external PTT.

Interface Cable

There are several eBay sellers offering interface cables for Motorola radios. At a minimum look for a 5-wire cable with a 16-pin accessory plug on it that fits all the CDM and CM series Motorola mobile radios.

Because some 16-pin plugs are not keyed, care must be used when inserting it into the 20-pin accessory receptacle on the CDM1550 radios, being certain to center the plug; that is, leave 2 pins bare on the left and 2 pins bare on the right so that the plug sits in the center 16 pins of the radio.

Motorola Speaker Jumper

Note: Jumper Motorola pins 15 and 16 together to enable the radio's internal speaker. The volume control will not affect the receive level of pin 11.

Pin Assignments

Mot	AM360r	Description
2	TXA	Transmit microphone audio to radio
3	PTT	Push-to-talk control signal to radio
7	GND	Ground, common, return
8	COS	Carrier-Operated Switch (COS, COR, RUS), receive activity indicator
11	RXA	Receive line-level audio from radio

Troubleshooting

If in doubt about the interface, a Volt meter can be used to determine if the COS input pin of the AM360r gateway changes when the attached Motorola radio is actively receiving a radio signal. It should be between 5 and 12 Volts when idle, and should drop to near 0 Volts during a received signal.

If the Voltage does not go low when the received signal is heard, then the **Motorola radio is not programmed properly** for use with a gateway. This is the #1 problem preventing proper operation of new installations. Check the accessory pin programming of the Motorola radio **FIRST**.

B

Appendix B Multicast Addressing Notes

Note 1: Avoid addresses of the form 224.0.0.x

Traffic to addresses of the form **224.0.0.x** is often flooded to all switch ports. This address range is reserved for link-local uses. Many routing protocols assume that all traffic within this range will be received by all routers on the network. Hence (at least all Cisco) switches flood traffic within this range. The flooding behavior overrides the normal selective forwarding behavior of a multicast-aware switch (e.g. IGMP snooping, CGMP, etc.).

Note 2: Watch for multicast address ambiguity

32 IP multicast addresses are mapped onto each Ethernet multicast address. A receiver that joins a single IP multicast group implicitly joins 31 others due to this overlap. The overlap occurs in the 5 high-order bits, so it's best to use the 23 low-order bits to make distinct multicast streams unique. For example, IP multicast addresses in the range **239.0.0.0** to **239.127.255.255** all map to unique Ethernet multicast addresses. However, IP multicast address **239.128.0.0** maps to **239.0.0.0**, **239.128.0.1** maps to **239.0.0.1**, etc.

Note 3: Avoid x.0.0.y and x.128.0.y

Combining notes 1 and 2, it's best to avoid using IP multicast addresses of the form **x.0.0.y** and **x.128.0.y** since they all map onto the range of Ethernet multicast addresses that are flooded to all switch ports.

Note 4: Watch for address assignment conflicts

IANA administers multicast addresses on the world-wide Internet. Potential conflicts with Internet multicast address assignments can be avoided by using (private) administratively scoped addresses. Such addresses can be safely used on a network connected to the Internet without fear of conflict with multicast sources originating on the Internet. Administratively Scoped addresses are roughly analogous to the unicast address space for private internets. Site-local multicast addresses are of the form **239.255.x.y**, but can grow down to **239.252.x.y** if needed. Organization-local multicast addresses are of the form **239.192-251.x.y**, but can grow down to **239.x.y.z** if needed.

The address range 239.252.1.1 through 239.255.255.254 is preferred to avoid multicast packet propogation outside of the private network.

IP Multicast Details
Detailed info at:
cisco.com
29west.com
smallnetbuilder.com

» See also Cisco's Guidelines for Enterprise IP Multicast Address Allocation paper available at
www.cisco.com

» See also "Multicast Address Assignment" at
www.29west.com

» See also Doug Reid's 3 part series "Multicasting and the Small Network" at
www.smallnetbuilder.com

C

Appendix C - WAVE Configuration

WAVE (Wide Area Voice Environment) from Twisted Pair Solutions provides the glue to tie together your various IP voice communications endpoints. The AudioMate 360 family of IP voice gateways works seamlessly with WAVE to extend your communications options and enhance interoperability among disparate devices.

Multicast groups are preferred for WAVE installations to allow many soft consoles to participate in the same communication channels without increasing the bandwidth consumed by each console. Deploying multicast links to each AudioMate 360 device allows for seamless failover if that option is implemented in WAVE. Any participating media server listens to the multicast streams and picks up where the failed media server dropped off.

However, in some networks the only option is unicast transmission. This forces the AudioMate 360 units to be configured as point-to-point trunk links and prevents their streams from being picked up automatically by a failover server. In other words, if the target media server fails at the other end of the point-to-point pipe the packets have nowhere to go. As long as these limitations are acceptable, unicast point-to-point links can be employed.

Multicast Configuration

AM360

Open a web browser and point it to the management IP address of the AudioMate 360 device to be configured. Log in with user **`admin`** and password **`password`** or the credentials that you have configured.

Under Configuration click **Global**.

In the field **RTP Remote IP** type the desired multicast group address, following the guidelines in Appendix B. Addresses in the **`239.255.x.y`** block are recommended for private local area networks. For **RTP Remote Port** and **RTP Local Port** type a port number between **`16384`** and **`65534`**; both fields should be identical numbers. For **Codec** select **G.711u**; if this network segment will not support about 100kbps streams then select **GSM**. Click the button **Update Configuration** to save your changes.

WAVE

Channels (WAVE 3)

Log in to WAVE. Click **Channels** -> **Channels**, then click the **Add Channel** button. From the dropdown listbox select **Multicast Trunk**, then click the **Next** button. In the **Name** field type a meaningful name. Tab to the **Description** field and type a meaningful description. Select a group from the **Group** listbox.

In the **IP address** field type the exact same multicast group address that you configured into the AM360 above. Tab over to the **Port** field and type the exact same port number that you configured into the AM360 above. Check the box labeled **Use the same IP address and port as 'Audio Receive'**. In the **Codec** listbox select the same codec as was selected in the AM360 above; if you choose **GSM** then set the **Scale** to 1. All remaining settings may be left at their defaults.

Click the **Save** button to save your changes. If there are no other configuration changes to be entered, click the button **Commit Changes**.

Channels (WAVE 4)

Log in to WAVE. Click **Media Servers** -> **Interfaces**, then click the **Add Interface** button. From the dropdown listbox select **VoiceInterop AM360** and click the **Next** button. In the **Name** field type a meaningful name. Tab to the **Description** field and type a meaningful description.

In the **Gateway IP Address** field type the management address of the AM360 that will be associated with this endpoint. In the **RTP Remote IP address** field type the exact same multicast group address that you configured into the AM360 above. Tab over to the **RTP Remote Port** field and type the exact same port number that you configured into the AM360 above. In the **RTP Local IP address** field type the exact same multicast group address that you configured into the AM360 above. Tab over to the **RTP Local Port** field and type the exact same port number that you configured into the AM360 above.

In the **Codec** listbox select the same codec as was selected in the AM360 above; if you choose **GSM** then set the **Scale** to **1**.

Click the **Save** button to save your changes. If there are no other configuration changes to be entered, click the button **Commit Changes**.

Sessions (WAVE 3)

If you already have the desired standard user channel configured, click **Sessions** -> **Sessions**, then click the **Add Session** button.

In the dropdown listbox select **Advanced**, then click the **Next** button.

Type a meaningful name in the **Name** field. Tab to the **Description** field and type a meaningful name. Select the desired group from the **Group** listbox and click the **Save** button to reveal the full Session configuration screen.

Leave the **Conference ID / DN** field blank and clear the checkbox labeled **Treat as the Dial-In DN**. Click the **Add Servers** button and select the desired media servers that will handle this session. Click the **Add Participant** button and add the multicast trunk channel from above and the desired standard user channel that will be bridged with this AM360 device.

Click the button **Save and Commit changes**. Your AudioMate 360 device is now bridged via multicast with the desired WAVE Standard channel. Test the configuration using an AudioMate Communicator soft console.

WAVE 4

The AudioMate 360 is integrated into WAVE 4 as a media server interface. Add an AM360 to a session as an interface.

Sessions (WAVE 4)

To configure a session in WAVE version 4, proceed as directed for WAVE 3 installations. The only difference comes when adding participants to the session. After adding the standard user channel as indicated for WAVE 3, click the **Add Participant** button again. In the dropdown listbox select **VoiceInterop AM360**, then click the **Next** button. Select the desired AM360 by checking the box next to it, then click the **Add Selected Participants** button.

Unicast Configuration

AM360

Open a web browser and point it to the management IP address of the AudioMate 360 device to be configured. Log in with user **`admin`** and password **`password`** or the credentials that you have configured.

Under Configuration click **Global**.

In the field **RTP Remote IP** type the unicast address of the target media server. For **RTP Remote Port** and **RTP Local Port** type a port number between **16384** and **65534**; both fields should be identical numbers. For **Codec** select **G.711u**; if your network will not support about 100kbps streams then select **GSM**. Click the button **Update Configuration** to save your changes.

WAVE

Channels (WAVE 3)

Log in to WAVE. Click **Channels** -> **Channels**, then click the **Add Channel** button. From the dropdown listbox select **Point-to-point Trunk**, then click the **Next** button. In the **Name** field type a meaningful name. Tab to the **Description** field and type a meaningful description. Select a group from the **Group** listbox.

In the **Trunk Side A IP address** field type the IP address of the target media server. In the **Port** field type the same port number that you configured into the AM360 above.

In the **Trunk Side B IP address** field type the IP address of the AM360 above. Tab over to the **Port** field and type the exact same port number that you configured into the AM360 above. In the **Codec** listbox select the same codec as was selected in the AM360 above; if you choose **GSM** then set the Scale to 1. All remaining settings may be left at their defaults.

Click the **Save** button to save your changes. If there are no other configuration changes to be entered, click the button **Commit Changes**; else, configure Sessions as above.

Channels (WAVE 4)

Log in to WAVE. Click **Media Servers** -> **Interfaces**, then click the **Add Interface** button. From the dropdown listbox select **VoiceInterop AM360** and click the **Next** button. In the **Name** field type a meaningful name. Tab to the **Description** field and type a meaningful description.

Remote vs Local

The terms Remote and Local are relative to the device that you are configuring. In WAVE, the media server is the Local address while Remote refers to the AudioMate 360 unit.

In the **Gateway IP Address** field type the management address of the AM360 that will be associated with this endpoint. In the **RTP Remote IP address** field type the management IP address of the AM360 above. Tab over to the **RTP Remote Port** field and type the exact same port number that you configured into the AM360's field labeled 'RTP Local Port'. Leave the **RTP Local IP address** field blank to use the binding IP address of the target media server. Tab over to the **RTP Local Port** field and type the exact same port number that you configured into the AM360's field labeled 'RTP Remote Port'.

In the **Codec** listbox select the same codec as was selected in the AM360 above; if you choose **GSM** then set the **Scale** to **1**.

Click the **Save** button to save your changes. If there are no other configuration changes to be entered, click the button **Commit Changes**.

The session that bridges these unicast channels is configured in a procedure similar to bridging multicast channels in WAVE version 4.

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